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**AQUATIC INVERTEBRATES AND HABITAT AT A FIXED
STATION ON THE MIDDLE FORK OF THE FLATHEAD RIVER,
FLATHEAD COUNTY, MONTANA**

August 7, 2001

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**A report to
the Montana Department of Environmental Quality
Helena, Montana**

**by
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INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Middle Fork of the Flathead River near West Glacier, Montana on August 7, 2001. The sample site was located by GPS reading at 48° 30' 20" N, 113° 59' 36" W, lying within the Montana Valley and Foothill Prairie Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of either a composite of four Hess samples, or a one-minute kicknet collection (Bukantis 1998). Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the revised method (Bollman 1998) for streams of Western Montana's ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity.

The revised bioassessment metric battery and its scoring criteria have not been evaluated for application to higher-order streams and rivers; to date, no bioassessment method has been contrived for these waterways in Montana. Thus, the method used here is likely to have limitations in its applicability to the sites in this study. For example, 21 of the riverine or high-order waterways sampled for the fixed station study were located within the Montana Valley and Foothill Prairies Ecoregion (MVFP) and were sampled between July 23 and August 25, 2001. Mean water temperature for these sites at the time of sampling was 19.8°C (median = 19.4°). Temperatures ranged from 15.5°C (Kootenai River near Libby) to 25.3°C (Jefferson River near Three Forks). Ninety-eight sites from the MVFP were used to assemble the revised metric battery and to test it for sensitivity in detecting impairment, to establish scoring criteria, and to improve robustness of bioassessment. These 98 sites were mainly second and third order streams; the sampling season roughly corresponded to that of the fixed-station study. Mean water temperature for these sites at the time of sampling was 15°C (median = 14°C). Natural variations in benthic community composition and structure along longitudinal and thermal gradients are well known phenomena. Thus, scores and classifications were established for much smaller systems with significantly lower water temperatures; impairment classifications and use support designations in this study must be interpreted with care. Results from the application of other metric batteries may be found in the Appendix.

RESULTS AND DISCUSSION

Table 1 itemizes the nine evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat conditions scored optimally at this site on the Middle Fork. Instream habitat parameters were judged to be essentially unimpaired by human activities. Streambanks were perceived to be moderately stable on the right bank, and vegetative protection was evidently disrupted in some areas on both banks. Riparian zone width was judged optimal.

Table 1. Stream and riparian habitat assessment for a fixed station on the Middle Fork of the Flathead River. August 2001.

Max. possible score	Parameter	Middle Fork of the Flathead River near West Glacier
10	Riffle development	9
10	Benthic substrate	10
20	Embeddedness	19
20	Channel alteration	18
20	Sediment deposition	19
20	Channel flow status	16
20	Bank stability: left / right	9 / 6
20	Bank vegetation: left / right	7 / 8
20	Vegetated zone: left / right	9 / 9
160	Total	139
	Percent of maximum CONDITION*	87 OPTIMAL

*Condition categories: Optimal > 80% of maximum score, Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%. Adapted from Platkin et al. 1998.

Table 2. Metric values, scores, and bioassessment for a fixed station on the Middle Fork of the Flathead River. The revised bioassessment metric battery (Bollman 1998) was used for the evaluation. August 2001.

	Middle Fork of the Flathead River near West Glacier	
METRICS	METRIC VALUES	METRIC SCORES
Ephemeroptera richness	6	3
Plecoptera richness	3	2
Trichoptera richness	3	2
Number of sensitive taxa	2	2
Percent filterers	61.0	0
Percent tolerant taxa	2.3	3
	TOTAL SCORE (max.=18)	12
	PERCENT OF MAX.	67
	Impairment classification	SLIGHT
	USE SUPPORT	PARTIAL

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on the Middle Fork is slightly impaired and only partially supports designated uses.

A rich mayfly fauna (6 taxa) and low biotic index value (3.70) suggest that water quality was good; the cold-stenotherm *Drumella doddsi* was abundant, implying cold water. The sampled assemblage was dominated by the blackfly *Simulium* sp., which comprised 54% of organisms collected. The presence of blackflies does imply that suspended organic particulates were present at least to some extent at the site; whether they were excessive cannot be determined based on *Simulium* sp. numbers alone. While the abundance of these filter-feeders could be interpreted to suggest that high volumes of suspended fine organic particulates were present, the finding may simply represent a serendipitous collection of a gregarious taxon. *Simulium* sp. tends to occur in large colonies or “blooms” distributed patchily over the benthic substrate. When such a bloom is intercepted during sampling, blackflies may comprise a larger proportion of the sample than their proportional representation in the benthic community. Filter-feeders are thus potentially over-represented in the data as well.

Ten “clinger” taxa, representing 88% of organisms in the sample, were collected, suggesting that substrate habitats were not limited by fine sediment deposition. Five predator taxa were present, suggesting that instream habitats were diverse and plentiful. The functional composition of the sample was skewed toward filter-feeders, an effect of *Simulium* sp. abundance, and although the data summary indicates that no scrapers were collected, in fact 13% of the animals collected function as scrapers but are considered primarily gatherers in the Montana Invertebrate Check-List (Bukantis 1998). Thus, all expected functional components of a healthy invertebrate community were present at this site.

CONCLUSIONS

- Although the sample was profoundly dominated by the blackfly *Simulium* sp., a rather tolerant filter-feeder, other aspects of the assemblage suggest that good water quality and unimpaired habitats characterized this site on the Middle Fork.
- The bioassessment method employed appears to have assigned an appropriate impairment category to this site, considering the taxonomic composition and tolerance characteristics of the benthic assemblage. The bioassessment score may under-estimate the quality of the fauna; in particular, the abundance of filter-feeders seems to be only slightly elevated over expectations for a riverine environment.

LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Master's (M.S.) Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft. April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Woods, A.J., Omernik, J. M. Nesser, J.A., Shelden, J., and Azevedo, S. H. 1999. Ecoregions of Montana. (Color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia. US Geological Survey.

APPENDIX

Taxonomic data and summaries

Middle Fork of the Flathead River

August 2001

Aquatic Invertebrate Taxonomic Data

Site Name: MF Flathead River near West Glacier

Date: 8/07/01

Site ID: C07MFKFR01

Approx. percent of sample used: 100

Taxon	Quantity	Percent	HBI	FEG
Nematoda	2	0.65	11	PA
Total Misc. Taxa	2	0.65		
<i>Baetis tricaudatus</i>	5	1.62	4	CG
<i>Drunella coloradensis</i>	1	0.32	0	CG
<i>Drunella doddsi</i>	24	7.79	1	CG
<i>Serratella tibialis</i>	5	1.62	2	CG
<i>Epeorus longimanus</i>	12	3.90	1	CG
<i>Rhithrogena</i> sp.	30	9.74	0	CG
Total Ephemeroptera	77	25.00		
<i>Claussenia sabulosa</i>	8	2.60	3	PR
<i>Hesperoperla pacifica</i>	3	0.97	2	PR
<i>Pteronarcella badia</i>	8	2.60	0	SH
Total Plecoptera	19	6.17		
<i>Hydropsyche</i> sp.	23	7.47	5	CF
<i>Lepidostoma</i> sp.-sand case larvae	1	0.32	1	SH
<i>Rhyacophila Angelita</i> Gr.	2	0.65	0	PR
Total Trichoptera	26	8.44		
<i>Zaitzevia</i> sp.	2	0.65	5	CG
Total Coleoptera	2	0.65		
<i>Atherix</i> sp.	1	0.32	4	PR
<i>Simulium</i> sp.	165	53.57	5	CF
<i>Hexatoma</i> sp.	1	0.32	2	PR
<i>Rhabdomastix</i> sp.	1	0.32	1	UN
Total Diptera	168	54.55		
<i>Micropsectra</i> sp.	4	1.30	4	CG
<i>Pagastia</i> sp.	1	0.32	1	CG
<i>Paratanytarsus</i> sp.	3	0.97	6	UN
<i>Tvetenia</i> sp.	6	1.95	5	CG
Total Chironomidae	14	4.55		
Grand Total	308	100.00		

Aquatic Invertebrate Summary

Site Name: MF Flathead River near West Glacier Date: 8/07/01

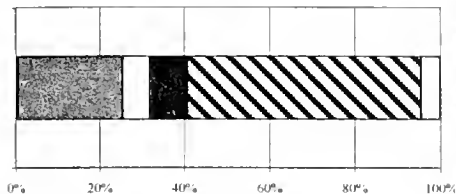
SAMPLE TOTAL 308

EPT abundance 122
TAXA RICHNESS 22
Number EPT taxa 12
Percent EPT 39.61

TAXONOMIC COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Misc. Taxa	0.65	1	2
Odonata	0.00	0	0
Ephemeroptera	25.00	6	77
Plecoptera	6.17	3	19
Hemiptera	0.00	0	0
Megaloptera	0.00	0	0
Trichoptera	8.44	3	26
Lepidoptera	0.00	0	0
Coleoptera	0.65	1	2
Diptera	54.55	4	168
Chironomidae	4.55	4	14

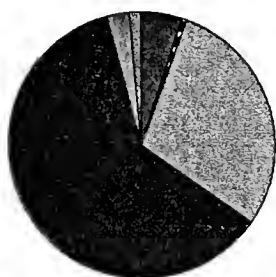
■ Misc. Taxa
■ Odonata
■ Ephemeroptera
□ Plecoptera
■ Hemiptera
■ Megaloptera
■ Trichoptera
□ Lepidoptera
■ Coleoptera
□ Diptera
□ Chironomidae



FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	4.87	5	15
Parasite	0.65	1	2
Gatherer	29.22	10	90
Filterer	61.04	2	188
Herbivore	0.00	0	0
Piercer	0.00	0	0
Scraper	0.00	0	0
Shredder	2.92	2	9
Xylophage	0.00	0	0
Omnivore	0.00	0	0
Unknown	1.30	2	4

■ Predator
■ Parasite
■ Gatherer
■ Filterer
■ Herbivore
□ Piercer
□ Scraper
■ Shredder
□ Xylophage
■ Omnivore
■ Unknown



COMMUNITY TOLERANCES

Sediment tolerant taxa 1
Percent sediment tolerant 0.32
Sediment sensitive taxa 0
Percent sediment sensitive 0.00
Metals tolerance index (McGuire) 4.31
Cold stenotherm taxa 1
Percent cold stenotherms 7.79

Site ID: C07MFKFR01

DOMINANCE

TAXON	ABUNDANCE	PERCENT
<i>Simulium</i> sp	165	53.57
<i>Rhythrogena</i> sp	30	9.74
<i>Drunella dookda</i>	24	7.79
<i>Hydropsyche</i> sp	23	7.47
<i>Epeorus longimanus</i>	12	3.90
SUBTOTAL 5 DOMINANTS	254	82.47
<i>Claassenia sabulosa</i>	8	2.60
<i>Pteronarcella badia</i>	8	2.60
<i>Isonychia</i> sp	6	1.95
<i>Baetis tricaudatus</i>	5	1.62
<i>Serratella tibialis</i>	5	1.62
TOTAL DOMINANTS	286	92.86

SAPROBITY

Hilsenhoff Biotic Index 3.70

DIVERSITY

Shannon H (loge) 1.48
Shannon H (log2) 2.13

Simpson D 0.25

VOLUNTINISM

TYPE	ABUNDANCE	PERCENT
Multivoltine	22	7.14
Univoltine	264	85.71
Semivoltine	22	7.14

TAXA CHARACTERS

	#TAXA	ABUNDANCE	PERCENT
Tolerant	2	7	2.27
Intolerant	2	25	8.12
Clinger	10	272	88.31

BIOASSESSMENT INDICES

B-IBI (Karr et al.)

METRIC	VALUE	SCORE
Taxa richness	22	3
E richness	6	3
P richness	3	1
T richness	3	1
Long-lived	1	1
Sensitive richness	2	1
%tolerant	2.27	5
%predators	4.87	1
Clinger richness	10	1
%dominance (3)	71.10	3
TOTAL SCORE		20

40 %

MONTANA DEQ METRICS (Bukantus 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	22	2	2	1
EPT richness	12	3	1	0
Biotic Index	3.70	3	3	2
%Dominant taxon	53.57	1	0	0
%Collectors	90.26	1	0	0
%EPT	39.61	2	1	0
Shannon Diversity	2.13	1		
%Scrapers + Shredd	2.92	0	0	0
Predator taxa	5	2		
%Multivoltine	7.14	3		
%H of T	88		1	
TOTAL SCORES		18	8	3
PERCENT OF MAXIMUM		60.00	33.33	14.29
IMPAIRMENT CLASS		SLIGHT	MODERATE	SEVERE

Montana DEQ metric batteries

